REMARKS

Claims 3, 9-24, 27, and 33-58 are pending in the application, of which Claims 15, 39, 49, and 54 are independent claims. Claims 14, 24, 38, and 48 have been rejected under 35 U.S.C. § 112; Claims 3, 9-24, 27, 34-36, 38, and 42-58 have been rejected under 35 U.S.C. § 103(a); Claims 9-11, 19-21, 34-36, and 43-45; Claims 13, 23, 38, and 47. The rejections have been made final. In response, the rejections are traversed. Clarifying amendments have been made to Claims 14, 24, 38, and 48.

It is noted that no reason has been given for the rejections of Claims 33, 37, and 39-41 and therefore those claims are considered to be in condition for allowance.

Regarding Rejections Under Section 112

Claims 14, 24, 38, and 48 have been rejected under 35 U.S.C. § 112, first paragraph, as being deemed to fail to comply with the written description requirement. Specifically, the Office Action asserts that the claims include subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors, at the time the application was filed, had possession of the claimed invention. The Office Action points to the term "cycle" as being undefined. The rejections are traversed.

As well known to those of ordinary skill in the art, the term unitless term "cycle" is a measure of an interval of time during which a characteristic, often regularly repeated event or sequence of events occurs. In the case of a piston, a cycle is understood to be the period in which the piston returns to its starting position. That definition is also understood by Brightwell. (*See* Column 1, lines 55-57; *see also* Column 1, lines 12-13). That is the same definition used by the Applicants.

Like many words, the term "cycle" can have other meanings, depending on context. In the performance table of Brightwell noted in the Office Action, the term is used to reference an arbitrary time period for a testing cycle (i.e. 8 hours). That period is chosen by a person and is not a characteristic of the piston or pump.

To clarify the claimed use of the term, the claims have been amended to recite "piston cycle."

Reconsideration of the rejections under 35 U.S.C. § 112 is respectfully requested.

Regarding Rejections Under Section 103

Claims 3, 12-18, 22-24, 27, 36, 38, 42, 46-58 stand rejected under 35 U.S.C. § 103(a) as being deemed unpatentable over U,S. Patent No. 6,568,911 to Brightwell et al. in view of U.S. Patent No. 4,856,967 to Jones. Claims 9-11, 19-21, 34-36, and 43-45 stand rejected under 35 U.S.C. § 103(a) as being deemed unpatentable over Brightwell et al. in view of Jones, and further in view of U.S. Patent No. 6,712,587 to Gerhardt et al. The rejections are traversed.

Before discussing the cited references, a brief summary of the claimed invention may be helpful. The Applicants disclose and claim a multi-stage compressor having a ball screw drive. As a multi-stage compressor, there are at least two piston chambers, each having a different volume. When fluid in a first piston chamber is compressed, it flows to a second piston chamber having a smaller volume, where it is further compressed. While multi-stage compressors in general are known in the art, the Applicants employ a ball screw drive system.

More specifically, the two pistons are directly connected by a threaded connecting member. A rotatable ball screw nut is engaged with the threaded member. A reversible motor rotates the ball screw nut to cause reciprocating linear translation of the connecting member and pistons. A check valve system maintains a unidirectional flow of fluid from the first inlet to the second outlet.

In comparison, Brightwell discusses a hydraulic compressor arrangement that employs hydraulic rams. The hydraulic rams operate by injecting pressurized hydraulic fluid on one side of a piston so as to compress gas in a compression chamber on the opposite side of the piston. The compressed gas is delivered to an external storage tank.

FIG. 2 of Brightwell illustrates a two-stage compressor. As shown, the pistons are operated by alternately flowing pressurize hydraulic fluid in to hydraulic chambers 10, 14. Brightwell does not disclose or suggest a ball screw drive.

In contrast, Jones discusses a hybrid pump that is driven by both pneumatic pressure and a ball screw drive. As discussed by Jones, the pump is used for gas-liquid permeameters to analyze oil field core samples. In that configuration, high pressure (e.g. 7,000 psig) gas or liquid is delivered to a core plug and then returned to the pump system. Although some pressure is lost on return, the return pressure is still high (e.g. 6,950 psig). As shown in FIG. 4 of Jones, the

pump is a single stage pump having a delivery chamber (24) and a booster chamber (410). Jones uses the return pressure to control a booster piston in the pump. Therefore, the pump only needs a small motive force from the ball screw to supply the differential pressure (e.g. 50 psig) needed to pump the delivery fluid. As shown in FIG. 5 of Jones, the hybrid pumps can be connected in parallel to provide a continuous flow of fluid over time.

Gerhardt discusses a hydraulic pump for providing high pressure fluid at a low flow rate. Gerhardt does not suggest a ball screw drive.

The combination of Brightwell and Jones, with or without Gerhardt, does not suggest the Applicants' claimed invention.

First, there is no motivation in the art to modify Brightwell to include the teachings of Jones. Brightwell is concerned with filling a storage tank while Jones is used to pump fluid for a permeameter. Brightwell's gas is not returned to the pump while the fluid in Jones is returned. Brightwell uses pressurized hydraulic fluid to compress the gas from low pressure to tank pressure. Because sufficient motive force is provided by the hydraulic system, there would be no need for a further low-power ball screw system. Indeed, the pump configuration of Jones would have no value to Brightwell.

Second, the Jones pump would be inoperable in the system of Brightwell. Again, the Jones pump relies on the delivery fluid being returned to the pump system under pressure. That is not possible in the Brightwell configuration because all of the delivery gas is stored in the tank. Furthermore, Brightwell explicitly employs Non-Return Valves (13, 16) to prevent gas from returning. Without recycling of the delivery fluid, the Jones pump would have no booster pressure and would not operate. As such, the Jones pump cannot be used to fill a storage tank and would be inoperable in Brightwell's system.

Gerhardt does not provide any additional motivation.

Reconsideration of the rejections under 35 U.S.C. § 103(a) is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If

the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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